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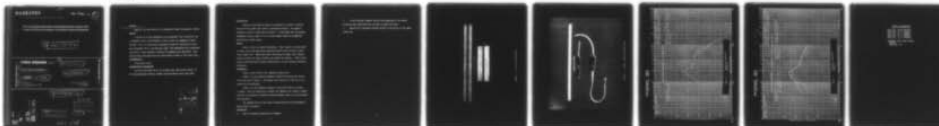
NAVY ELECTRONICS LAB SAN DIEGO CALIF  
MAGNETIC RUBBER HYDROPHONES. (U)  
AUG 66 F R ABBOTT  
NEL-TM-971

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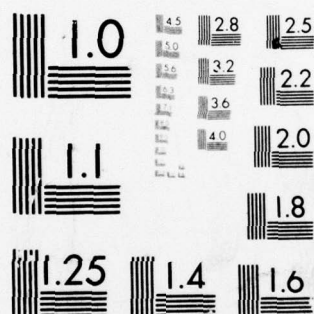
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MICROCOPY RESOLUTION TEST CHART  
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U. S. NAVY ELECTRONICS LABORATORY, SAN DIEGO, CALIFORNIA

MOST Project - 4

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This is a working paper giving tentative information about some work in progress at NEL.  
If cited in the literature the information is to be identified as tentative and unpublished.

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(14) NEL-TM-971

NEL/Technical Memorandum 971

TECHNICAL MEMORANDUM TM-971

(9)

Technical memo.

MAGNETIC RUBBER HYDROPHONES.

8 August 1966

(12) 8p.

F. R. Abbott (Code 3130)

(16) F10103

SF 101 03 16(11351)  
NEL L30761

LPN

NEL/Technical Memorandum 971

(17) SF1010316

TM 971

12/15

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#### PROBLEM

✓ The objective of this study was to

Appraise the practicability of hydrophones formed from magnetic rubber.

#### RESULTS

A series of 23 such hydrophones were assembled, their sensitivity was a tolerable -100 to -120 dbv/dyne in view of their low impedance of about 20 ohms. A 15 to 1 turns ratio transformer raised the sensitivity to the more acceptable -80 to -100 dbv/dyne range. The hydrophones were intolerably sensitive to static pressure variations accompanying sea operations. They could perhaps find application as towed arrays in lakes or very quiet seas.

#### RECOMMENDATION

Discontinue effort.

#### ADMINISTRATIVE INFORMATION

Work was done under SF 101 03 16 Task 11351, NEL Problem L30761, by the Electrodynamics Division of NEL, Code 3130 during Fiscal Year 1966.

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## INTRODUCTION

Flexible strip magnetic material as marketed is usually of powered Barium Ferrite loaded latex rubber or polyvinyl chloride. Its magnetic remanance is about a tenth that of Alnico V. It was hoped that serviceable hydrophones could be made of it to be less fragile than the contemporary piezoelectric ceramic types.

## DESIGN

Figure 1 shows two opened hydrophones. These consist of mating pairs of rubber strip with magnetically opposing bobbins wound with #30 Formvar coated copper wire. Additional rubber rods along the edges, when cemented together provide for about 0.020" air gap between the bobbins. Their mutual repulsion precludes pole locking, characteristic of many variable reluctance transducers.

## PERFORMANCE

Figure 2 shows three of the completed sealed units.

Figure 3 is the frequency response of Serial # 16 which was similar to the top unit of figure 1. The output level from 100 to 1000 cps is considered very satisfactory.

Figure 4 is the frequency response of Serial # 6 which was similar in design. Note the sensitivity to depth that appeared even though a bladder reservoir was attached to maintain internal pressure equal to the surrounding water pressure.

The response level is the series voltage from sets of wound magnetic bobbins shown by figure 1.

## CONCLUSIONS

1. The low frequency sensitivity is adequate.



2. A broad resonant response results from compliance of the rubber strips and gas, associated with the mass of rubber and water.
3. Sensitivity to pressure obviates utility of the device to sea operational use.

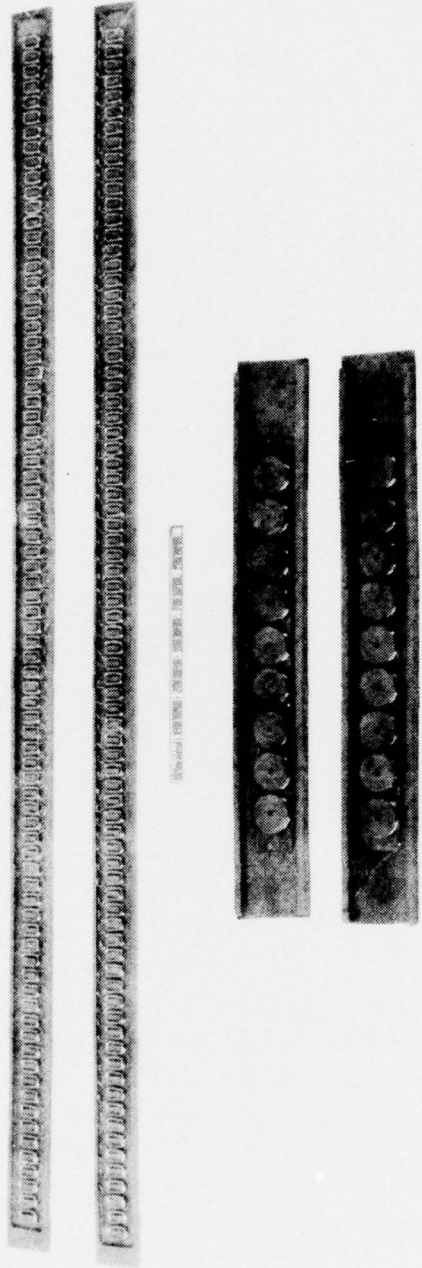


Figure 1 -- Two open hydrophones.

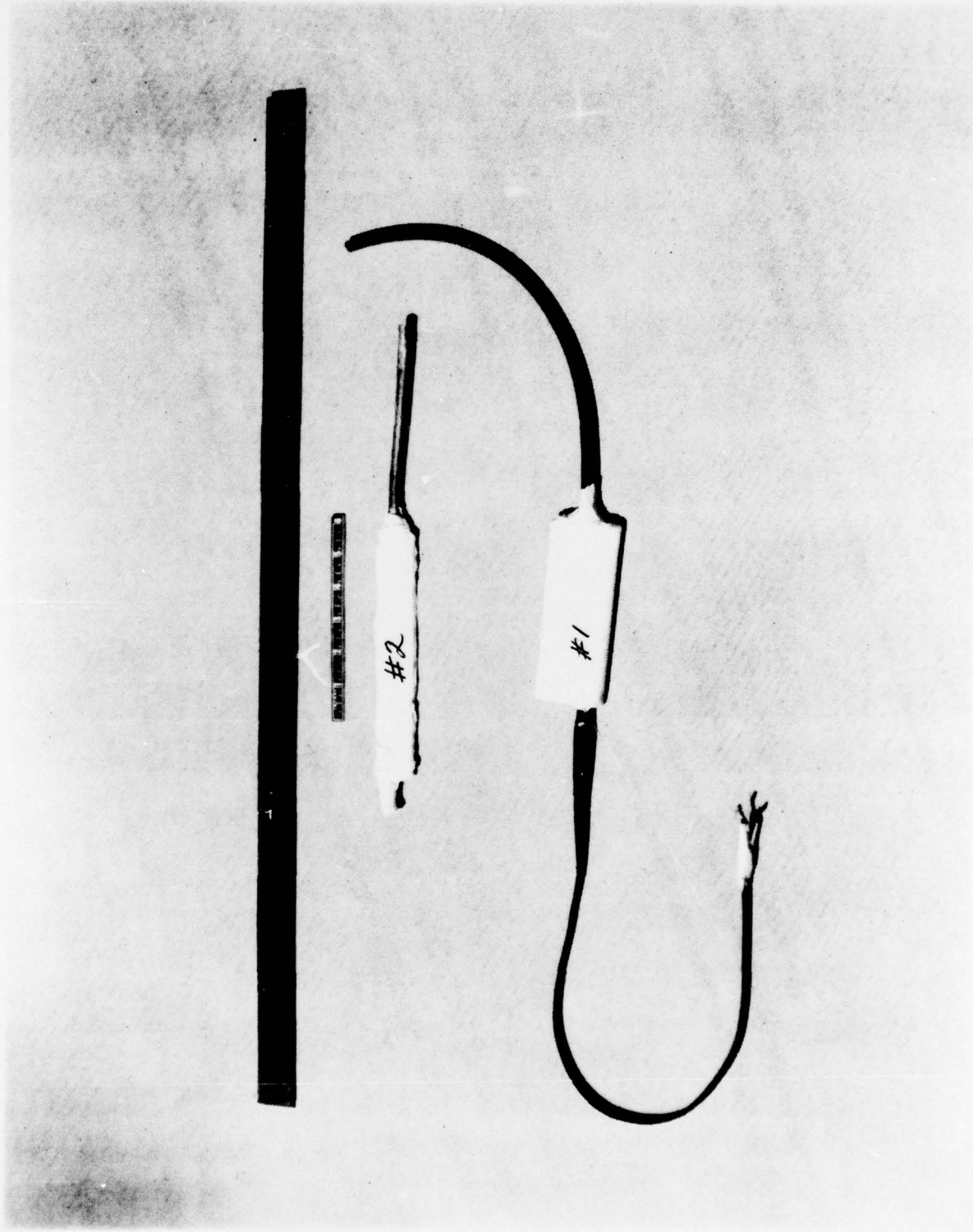


Figure 2 -- Three completed sealed units.



359T-71  
MADE IN U.S.A.  
ALBANY, N.Y.

SEMI-LOGARITHMIC  
KEUFFEL & ESSER CO.  
3 CYCLES X 70 DIVISIONS

K-E

Measured at TRANSDB  
10 June 1965

U.S. NAVY ELECTRONICS LABORATORY  
Transducer Calibration Facility  
San Diego, California 92152

RECEIVING RESPONSE OF TUBBER #16

Temperature: 21° C  
Depth: 3 meters

Open-circuit voltage measured at  
the end of the cable supplied  
with unit.

90

100

110

120

130

db below 1 volt/microamp

Figure 3 -- Frequency response of  
Serial 16.

Frequency in Kc

0.1

1.0

10

6

K-E SEMI-LOGARITHMIC 359T-71  
 MADE IN U.S.A.  
 3 CYCLES X 70 DIVISIONS ALBANY, N.Y.

MEASURED AT TRANSDEC  
 26 March 1965

U.S. NAVY ELECTRONICS LABORATORY  
 Transducer Calibration Facility  
 San Diego, California 92162

RECEIVING RESPONSE OF FLUBBER NO. 6 WITH TRANSFORMER

Temperature: 17° C  
 Depth: 2.0 meters  
 4.0 meters  
 6.0 meters

Open-circuit voltage measured at the  
 output of the transformer supplied  
 with unit.

db below 1 volt/microbar

70  
 80  
 90  
 100

Figure 4 -- Frequency response of  
 Serial 6.

Frequency in Hz

0.01

.1

1

10

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